THE MEASUREMENT OF REFRACTION.

Refraktometrisches Hilfsbuch. By Prof. W. A. Roth and Dr. F. Eisenlohr. Pp. viii + 146. (Leipzig: Veit and Co., 1911.) Price 6 marks.

A MEASUREMENT of the refractive power of a liquid, while of considerable practical value for identifying the liquid or for ascertaining its freedom from impurities, is of far greater importance from the purely scientific point of view. Investigation has shown that for each substance a relation subsists between the refractive index and the density that is independent of the temperature; and, further, that the specific refractive index, as this relation is termed, may be calculated when the molecular constitution is known. Various formulæ have been suggested for the specific refractive index. Thus Gladstone and Dale on empirical grounds proposed $\frac{n-1}{a}$; while a more accurate expression $\frac{n^2-1}{n^2+2} \cdot \frac{1}{d}$ was afterwards put forward simultaneously from theoretical considerations by two men of nearly the same name, Lorenz in Copenhagen and Lorentz in Leyden.

The little book which Prof. Roth and Dr. Eisenlohr have prepared will prove invaluable to investigators in the subject, and, in fact, to all who have need to measure the refractive indices of liquids with the highest possible degree of accuracy. They fully describe the various forms of refractometer in use for the purpose and the methods of using them, and state the corrections necessary when the temperature of the observations differs appreciably from the standard, and give in tables the indices corresponding to the divisions in instruments with arbitrary scales. The old method of determining the deviation of a beam of light passing through the liquid contained in a hollow glass prism has entirely given way to the more convenient and more accurate method based upon the principle of total-reflexion. They describe further with equal fulness the method of finding the density by means of a pyrometer, point out the corrections required by the expansion of the glass, and give tables to facilitate their application. Towards the end of the book the authors show by a few examples how closely the observed value of the molecular refractive index agrees with that deduced from the constitution, and discuss the meaning of the sensible differences that occur in certain groups of substances. The book closes with some useful tables, and a small book of five-figure logarithms is enclosed in a pocket within the cover.

OUR BOOKSHELF.

The Modern Locomotive. By C. Edgar Allen. Pp. ix + 175. (Cambridge: The University Press, 1912.) Price 1*s.* net.

THIS volume belongs to the series of Cambridge Manuals of Science and Literature, and taken as a whole the information given in it is up to date and described in terms clearly evident to the lay reader.

As the boiler is "the heart and soul" of a locomotive, the author deals with it in chapter i. He claims that the multitubular boiler as fitted to the "Rocket" originated with Mr. Booth, the secretary of the Liverpool and Manchester Railway—an unwarrantable claim, and one made for the first time, so far as the present reviewer's knowledge of locomotive history goes. The "Rocket's" multitubular boiler was to the designs of William Henry James, son of William James—the father of railways. In an agreement dated September 1, 1821, W. H. James's patent was assigned to Messrs. G. Stephenson and Wm. Lush on certain terms, and it was with this boiler the prize of 500*l.* was won at Liverpool in 1827 by the "Rocket."

The chapter is interesting; it illustrates how old ideas are resuscitated even in locomotive engineering; for instance, the spark arrestor, so called, illustrated in Fig. 9, and the variable blast pipe in Fig. 10, were both in use on the Manchester, Sheffield, and Lincolnshire Railway, now the Great Central Railway, in the year 1878. The question of a satisfactory spark arrestor is a prominent one at the present time, and many experiments are in progress: a combination of Louvre plates on the smoke box and an ash-ejecting arrangement on the blast pipe is now giving satisfactory results. Chapter iii. is devoted to modifications and improvements in the standard boiler.

The volume will be found to contain much interesting and useful information. It should be of much use to those of the general public who take an intelligent and intense interest in the locomotive. To the apprentice in the works the information should be of particular value.

N. J. L.

The Gardener and the Cook. By Lucy H. Yates. Pp. x + 260. (London: Constable & Co., Ltd., 1912.) Price 3*s.* 6*d.*

THIS little book is attractive in more ways than one. It stimulates the imagination as to what can be done both in garden and kitchen, more especially in the kitchen. It leaves, however, a little sediment of despair in the mind, after all, for where out of France are "Charlottes" to be found? So much depends upon "Charlotte," the cook.

What use is a kitchen-garden, however successful, if you have a stupid, obdurate "Charlotte," who will not see that to be a real cook is to have a talent for taking pains, and that to be careful and wise is not to be mean? Who can persuade our English cooks that cooking is an art, and

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requires interest, care, and work, and some imagination, and not a thing to be undertaken only to be done with as soon as possible?

Would these women who are clamouring for the "right" to do work for which they are obviously unfitted turn their superfluous energies to training themselves and then training our "Charlottes" in the knowledge of the delights of the combination of thrift and dainty dishes, of which this book gives so fascinating and practical an account, then indeed would their now wasted energies have some real and useful result. There is no more needed reformation than that of work in our kitchens. To anyone with a conscience and some little knowledge, the wastes and missed opportunities, even in the simplest kitchen, are appalling.

This book should be a help to many a young housekeeper towards bettering things in her own home and perhaps inspiring a young "Charlotte" to realise the beauty and importance of her work, and to lead her on also to realise the importance of small things in the kitchen.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of Nature. *No notice is taken of anonymous communications.]*

Acquired Characters and Stimuli.

I thank Sir Ray Lankester for the complimentary expression with which he begins his letter (Nature, March 21) and for the friendly feeling which prevents him saying I am quibbling. However, he gives his reason for thinking I am quibbling. I will admit my offence if he will indicate precisely how an inborn trait is more inborn and less acquired than an acquirement. In my letter I implied that by "acquired character" biologists mean a trait developed under the influence of use or injury. Sir Ray Lankester insists that I am wrong. He says that Lamarck, the original user, employed the term to indicate a trait which is "abnormal," because the individual who developed it was exposed to an "abnormal environment." To quote his own words, "The new character or characters developed in response to the abnormal environment (which we assume to be allowed to act on the growing individual only, and not on its parents) are called by Lamarck —and those who wish to discuss Lamarck's theory—'acquired characters' (*changements acquis*). The word 'acquire' is used to mean something 'added to' or 'changed in' the normal form of the species." He adds "That, I take it, is Lamarck's meaning, and it is what I, and others, have for more than twenty-five years accepted."

I cannot, of course, be sure of the identity of the "others" to whom Sir Ray alludes as having taken part in "a historical discussion," but the following passages are taken at random from men who were not unknown about that time. "Lamarck . . . attributed the changes of species chiefly to the effects of changes in the conditions of life—such as climate, food, &c.—and especially to the desires and efforts of the animals themselves to improve their condition, leading to a modification of form or size in certain parts, owing to the well-known physiological law that all organs are strengthened by constant use, while they are weakened or even completely lost by disuse."[1] "It seems difficult and well-nigh impossible to deny the transmission of acquired characters when we remember the influence which use and disuse have exercised upon certain special organs. It is well known that Lamarck attempted to explain the structure of the organism as almost entirely due to this principle alone."[2] "And so in the case of other animals, Lamarck believed that the adaptation of their forms to their habits could be explained by this simple hypothesis that the habits created the forms, through the effects of use and disuse, coupled with heredity. Such is what is ordinarily known as Lamarck's theory of evolution. We may as well remember, however, that it really constitutes only one part of his theory; for besides the hypothesis of the cumulative inheritance of functionally-produced modifications—to which we may add the inherited effects of any direct action exercised by surrounding conditions of life—Lamarck believed in some transcendental principle tending to produce gradual improvement in predetermined lines of advance. Therefore it would be more correct to designate the former hypothesis by the name either of Erasmus Darwin, or, still better, of Herbert Spencer. Nevertheless, in order to avoid confusion, I will follow established custom, and subsequently speak of this hypothesis as the Lamarckian hypothesis—understanding, however, that in employing this designation I am not referring to any part or factor of Lamarck's general theory of evolution other than the one which has just been described—namely, the hypothesis of the cumulative transmission of functionally-produced or otherwise 'acquired modifications.'"[3]

It will be seen that I have sinned, if I have sinned, in good company. The men from whom I quote evidently regarded an acquired character as, in essence, a "functional modification," an effect of "use or disuse," "to which may be added the inherited effects of any direct action exercised by surrounding conditions of life" (*e.g.* injury). I suppose I could cite scores or hundreds of similar passages. The fundamental errors expressed or implied in them all are (1) that there is a general law that *all* organs are strengthened by constant use and weakened by disuse, and (2) that use and disuse produce only "abnormal" traits. There is no such law; some structures (*e.g.* external ears, hair, teeth) in the higher animals (*e.g.* man) are not in the least affected by use; there is no clear evidence that animals low in the scale of life develop at all under this influence; and very clear evidence that the power, the potentiality, of so developing has undergone such increase in the higher animals that it constitutes the main feature of their evolution. To it they owe all their physical and mental adaptability—their intelligence, for instance. The child grows into the adult just as much under its influence as the adult grows into the exceptional adult (*e.g.* the trained athlete). We have every reason, therefore, to believe that the potentiality to develop under the influence of use, at any rate to any considerable extent, is a late and a high product of evolution. The point raised by Sir Ray Lankester is, however, as far as I am concerned, immaterial—a distinction without a difference. If he prefers, let us, by all means, consider abnormality resulting from abnormal use as the distinguishing characteristic of an acquirement. To take an illustration, the muscular development, both of the ordinary individual and of the blacksmith, is due to use. Sir Ray Lankester regards the former as normal, and *therefore* inborn

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[1] Wallace, "Darwinism," p. 3.

[2] "Weismann on Heredity," English translation, 2nd edition, vol. i., pp. 83–4.

[3] Romanes, "Darwin and After Darwin," vol. i., p. 255.

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